State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

Department of Administrative Services
D'ARCY DIXON PIGNANELLI
Executive Director

Division of Facilities Construction and Management
F. KEITH STEPAN
Director

ADDENDUM #2

Date:	29 March 2006
To:	Design/Build Teams
From:	David McKay, Project Manager, DFCM
Reference:	Digital Learning Center – Design/Build Utah Valley State College DFCM Project No. 05188790
Subject:	**Addendum No. 2**

Pages		
	Addendum	2 pages
	Architectural Attachment	30 pages
	Total	**32 pages**

Note: This Addendum shall be included as part of the Contract Documents. Items in this Addendum apply to all drawings and specification sections whether referenced or not involving the portion of the work added, deleted, modified, or otherwise addressed in the Addendum. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

2.1 GENERAL

2.1.1 The follow is a schedule of the User Input & Design Meetings.

First User Input & Design Meetings, April 6, 2006
McKay Events Center, Presidential South
Park west of Events Center

8:00 am to 9:45 am	Layton/CRSA
10:00 am to 11:45 am	Jacobsen/MHTN
1:00 pm to 2:45 pm	Big D/GSBS
3:00 pm to 4:45 pm	Okland/FFKR

2.1.2 **Second User Input & Design Meetings, Wednesday, April 26, 2006**
McKay Events Center, Presidential South
Park west of Events Center

8:00 am to 9:45 am	Big D/GSBS
10:00 am to 11:45 am	Okland/FFKR
1:00 pm to 2:45 pm	Layton/CRSA
3:00 pm to 4:45 pm	Jacobsen/MHTN

2.1.3 **Third User Input & Design Meetings, Thursday, May 4, 2006**
McKay Events Center, Presidential South
Park west of Events Center

8:00 am to 9:45 am	Jacobsen/MHTN
10:00 am to 11:45 am	Big D/GSBS
1:00 pm to 2:45 pm	Okland/FFKR
3:00 pm to 4:45 pm	Layton/CRSA

End of Addendum

M H T N A R C H I T E C T S

Facsimile

To: Mr. David Mc Kay

Fax: 801-538-3267

From: Bruce Barnes

Date: November 14, 2005

Re: UVSC – Soils Report

This fax transmission contains (29) page(s), including this page.

Dear David,

Per our conversation on Friday November 11, I am sending you the information you requested, "Geotechnical Investigation" Utah Valley State College" New Academic Building from May Of 2001.

This was bound into the project Manual for the UVSC Liberal Arts Building and can also be found in that document.

Please let us know if we can be of any further assistance.

Sincerely,

Bruce H. Barnes

Bruce H. Barnes, AIA
Principal
MHTN Architects, Inc.

Phone 1-801-326-3206
Fax 1-801-326-3306
Email bruce.barnes@mhtn.com

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Geotechnical Investigation

Utah Valley State College

New Academic Building

Orem, Utah

May 2001

RB&G ENGINEERING, INC.

Professional Engineers

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RB&G
ENGINEERING
INC.
1435 WEST 820 NORTH,
PROVO, UT 84601-1345
801 374-5771 Provo
801 521-5771 SLC

May 11, 2001

Angelica M. Pavoni
HFS Architects
8 East Broadway, Suite 410
Salt Lake City, UT 84111

Dear Ms. Pavoni:

This report outlines the results of a geotechnical investigation performed at the site of the new Academic Building to be located on the Utah Valley State College (UVSC) campus in Orem, Utah. The purpose of this investigation was to determine the characteristics of the subsurface material throughout the site so that satisfactory substructures can be designed to support the proposed facility. The results of the investigation, along with pertinent recommendations for foundation design, are outlined in the following sections of this report.

The information contained in the report is discussed under the following headings: (1) Geological and Existing Site Conditions, (2) Subsurface Soil and Water Conditions, (3) Foundation Considerations and Recommendations, and (4) Site Preparation and Compacted Fill Requirements.

1. GEOLOGICAL AND EXISTING SITE CONDITIONS

The UVSC Orem campus is located between 800 South and 1200 South and between 600 West and Interstate 15 in Orem, Utah. The surface soils in this area have been mapped as Lacustrine sand deposits laid down during the regressive phase of ancient Lake Bonneville (upper Pleistocene). Previous campus investigations indicate that the subsurface soils will consist of interbedded sands, silts and clays.

The Wasatch Fault is located near the base of the Wasatch Mountain Range, about 4.5 miles east of the site. As a consequence of past and potential earthquake activity, the area is designated as Seismic Zone 3 according to the 1997 edition of the Uniform Building Code. Utah County Natural Hazards Maps identify this area as having moderate liquefaction potential.

Photographs presented in Figure 1 illustrate the existing site conditions. It will be observed that tennis courts and a volleyball court occupy the

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center of the proposed building site. Berms ranging in height from 3 to 8 feet surround the center area. The tennis courts are covered with concrete and the volleyball court is sand. Lawn grass surrounds the courts with a few small trees (~10' high) along the east and west sides. Concrete walkways exist on the east and south, outside of the grassy area. The P.E. building is located immediately south of the proposed new structure, as shown in Photograph A. Foundation performance for structures in the vicinity of the site appear to be performing in a satisfactory manner, in that no cracking was observed in foundation walls. No water conveyance facilities or other water bodies exist in the immediate vicinity of the site which would influence the groundwater level at this site. The groundwater level throughout the area is, however, influenced by irrigation of ground on the Provo-Orem Bench located east of the campus. Other than the information provided above, no conditions appear to exist at this site which would adversely effect foundation performance.

2. FIELD AND LABORATORY TESTING PROCEDURES

The characteristics of the subsurface material were defined by drilling 6 borings to a depth of about 40 feet and 1 boring to a depth of about 20 feet at the approximate locations as shown in Figure 2. The logs for the borings are presented in the Test Hole Log section of this report.

During the subsurface investigation, sampling was performed at three to five-foot intervals throughout the depth investigated. Both disturbed and undisturbed samples were obtained during the field investigations. Disturbed samples were obtained by driving a 2-inch split spoon sampling tube through a distance of 18 inches using a 140-pound weight dropped from a distance of 30 inches. The number of blows to drive the sampling spoon through each 6 inches of penetration is shown on the boring logs. The sum of the last two blow counts, which represents the number of blows to drive the sampling spoon through 12 inches, is defined as the standard penetration value. The standard penetration value, corrected for overburden and hammer energy, provides a good indication of the in-place density of sandy material; however, it only provides an indication of the relative stiffness of the cohesive material, since the penetration resistance of materials of this type is a function of the moisture content.

Miniature vane shear tests, which provide an indication of the undrained shearing strength of cohesive materials, were performed on samples of the clay soil during the field investigations. The results of these tests are shown on the boring logs as the torvane value in tons per square foot (tsf).

Undisturbed samples were obtained by pushing a thin-walled sampling tube into the subsurface material using the hydraulic pressure on the drill rig. The location at which the undisturbed samples were obtained are shown on the boring logs.

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Each sample obtained in the field was classified in the laboratory according to the Modified Unified Soil Classification System. The symbol designating the soil type according to this system, is presented on the boring logs. A description of the Modified Unified Soil Classification System is presented in the appendix, and the meaning of the various symbols shown on the boring logs can be obtained from this figure.

Laboratory tests performed during this investigation to define the characteristics of the subsurface material throughout the proposed site included in-place dry unit weight, natural moisture content, Atterberg Limits, mechanical analyses, unconfined compressive strength, and consolidation tests.

The results of all laboratory tests performed during this investigation, with the exception of the consolidation tests, are presented on the boring logs and summarized in Table I, Summary of Test Data, in the Laboratory Testing section of this report.

The compressibility characteristics of the subsurface material were evaluated by performing consolidation tests, and the results of these tests are also presented in the Laboratory Testing section. During the performance of the consolidation tests, each sample was permitted to absorb water at the beginning of the test to determine the effect of moisture on the compressibility characteristics of these materials.

3. SUBSURFACE SOIL AND WATER CONDITIONS

The logs for the borings are presented in the Test Hole Log section of this report, and it will be observed that the subsurface profile generally consists of silty sand and sandy silt (SM, ML), underlain by lean clay (CL-1). The approximate elevation of the predominant soil within the profile at each bore hole location is summarized below, using the floor of the P.E. building as a relative elevation equal to 100 feet:

BORE HOLE NO.	TOP OF BORING ELEV.	GROUND WATER ELEV.*	PREDOMINANT SOIL ELEVATION (ft)		
			SAND	SILT	CLAY
1	96.5	79.5	96 - 82	82 - 69	69 - 54
2	97.3	79.3	97 - 73	None	73 - 56
3	90.7	NM	83 - 78 58 - 49	90 - 83 78 - 74	74 - 58
4	92.4	83.9	91 - 84 53 - 51	84 - 81	81 - 53
5	93.1	84.1	92 - 79 52 - 51	None	79 - 52
6	94.1	84.1	87 - 81 61 - 53	94 - 87 81 - 75	75 - 61
7	94.7	83.2	94 - 84	84 - 78	78 - 72

* Measured at time of drilling (May 2001)

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Test Holes 1, 2 and 3 were drilled along the westerly side of the proposed structure, and it will be observed that the groundwater level was at about elevation 79.5 feet. Test Holes 4, 5 and 6 were drilled along the easterly side of the proposed structure, and it will be observed that the groundwater level was at about elevation 84 feet, indicating a westerly hydraulic gradient.

The characteristics of each of the predominant soils are discussed below as follows:

Sand

The upper silty sand layer in Test Holes 1 through 4 and 7 is in a medium dense to dense condition. The upper silty sand layer in Test Holes 5 and 6, however, is in a relatively loose condition. The upper silty sand has between 17 and 42% non-plastic silt. Silty sand layers encountered below the lean clay vary from medium dense to very dense.

Silt

A sandy silt layer was encountered in Test Holes 1, 3, 4, 6 and 7 immediately above the lean clay layer. The sandy silt is non-plastic and has between 32 and 50% in the sand size range. This material varies from soft to firm with standard penetration values ranging from 3 to 5.

Clay

It will be noted from the above table that a significant clay layer exists at each of the bore hole locations, with the top of the clay layer varying from elevation 69 to 81 feet. The results of the miniature vane shear and standard penetration tests indicate that the cohesive material is in a firm to very stiff condition. The liquid limit of the cohesive soil varies from 27 to 38, with the plasticity index ranging from 3 to 16, with the material classifying as a lean clay (CL-1). The unconfined compressive strength of cohesive samples tested ranges from 1278 to 1791 pcf. The in-place density of the cohesive material ranges from 77.8 to 85.5 pcf, with natural moisture contents ranging from 30.6 to 36.0%.

Consolidation tests were performed on samples of the lean clay obtained from Test Hole 4 at a depth of 12 feet (~ elev. 80) and Test Hole 5 at depths of 14 and 20 feet (~ elev. 79 and 53). It will be observed that the lean clay is over-consolidated with the over-consolidation ratio ranging from 3 to 5.

4. FOUNDATION CONSIDERATIONS AND RECOMMENDATIONS

A. FOUNDATION TYPES AND BEARING CAPACITIES

We understand that the structure will be a 3 story cast-in-place frame building with a 40,000 sq ft footprint, and that the bottom floor level of the new building will be 15 feet below the floor

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level of the existing P.E. building. It is also our understanding that the exterior walls will be brick veneer infill between concrete columns. The magnitude of the structural loads are not known as of the preparation of this report; however, it is assumed that column loads will not exceed 400 kips.

If the foundations for the proposed structure are located 1.5 feet below the lower floor level, the foundation subgrade would be at about elevation 83.5 feet (assuming elevation 100 for the floor of the P.E. building). The native soils within the zone of significant stress for foundations located at this level would consist predominantly of silty sand and sandy silt on the westerly side, and sandy silt and lean clay on the easterly side. The allowable bearing capacity of the silty sand and sandy silt generally varies from 1000 to 1500 psf, depending upon footing size; however, the sandy silt layer which overlies the lean clay in Test Holes 3, 6 and 7 is soft and wet and not capable of supporting structural loads. The allowable bearing capacity of the underlying lean clay varies from about 1200 to 1500 psf. It is readily apparent that supporting the structure using spread foundations on the native material would result in very large footings, and it is our opinion that alternative footing types should be used to support the proposed facility.

(1) Spread Foundations on Compacted Sandy Gravel

A considerable increase in the allowable soil bearing pressure can be obtained if the foundations for the proposed facility are supported on compacted fill. The magnitude of the allowable soil bearing pressures will depend primarily on the depth of the compacted fill. If spread foundations on compacted fill are used to support the proposed facility, we recommend that the spot footings be sized according to the allowable soil bearing pressures tabulated below:

DEPTH OF COMPACTED FILL	ALLOWABLE SOIL BEARING PRESSURE (psf)
0.5 x B	2700
0.6 x B	3072
0.7 x B	3468
0.8 x B	3888
0.9 x B	4332
1.0 x B	4800

B = width of footing

It is recommended that a minimum of 3 feet of compacted sandy gravel be placed beneath all structural foundations. In addition to the increase in allowable soil bearing pressure,

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excavation of the loose silty sand below the groundwater table will mitigate the liquefaction concern discussed in a subsequent section of this report. The width of the compacted fill supporting structural foundations should be equal to twice the width of the footing, except that in no case should the width of the compacted fill be less than the width of the footing plus the depth of the fill. It should also be noted that placement of structural fill will require dewatering, since the elevation of the groundwater level is above the footing subgrade level on the easterly side and only a few feet below the subgrade level on the westerly side.

We recommend that a drain be constructed around the periphery of the building extending into the brown lean clay to lower the groundwater level. The peripheral drain should be located at least 5 feet outside the building lines, and cross drains should be constructed within the building area to ensure that the groundwater level is maintained below the level of the fill.

If the foundations for the proposed facility are designed in accordance with the recommendations outlined above, the maximum settlement of any footing should not exceed one inch and differential settlement throughout the structure should not exceed 0.5 inch, which should be satisfactory for the proposed facility. It is generally recognized that the tolerable differential settlement for steel and concrete structures is about 0.002 times the column spacing. This criteria is tantamount to a differential settlement of about 0.5 inch for column spacings of 20 feet and 0.7 inch for column spacings of 30 feet. Since it is not anticipated that the column spacing for this structure will be less than 20 feet, a differential settlement of 0.5 inch should be satisfactory for the proposed facility.

(2) Deep Foundations

Supporting the structure using deep foundations is an alternative to spread foundations on compacted sandy gravel. Pile capacities have been computed for 12 inch, 14 inch, and 16 inch diameter, closed end pipe piles with a tip elevation extending into the silty sand layer encountered at a depth of about 45 feet below the floor of the P.E. building in Test Holes 3 and 6 at the northwest and southeast corners of the site, respectively. The layer was encountered at a depth of about 47 feet below floor level in Test Holes 4 and 5. The axial compressive single pile capacities are tabulated below assuming the pile cap at a depth of 17 feet below the floor level of the P.E. building and the pile tips to be at a depth of about 50 feet below the floor level:

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Pile Diameter (inches)	Ultimate Load (kips)	Allowable Load (kips) using a factor of safety of 3.0
12	142	47
14	183	61
16	229	76

It is recommended that the closed end piles be filled with concrete. The 12-inch size pile with 3/8-inch wall is the most common size presently being used in the area. We recommend that thinner walled pipe not be used due to the driving resistance of medium dense sand layers throughout the profile. For spacings of at least 3 pile diameters, no compressive group reduction factor is required. It is expected that pile group settlement will be less than 1 inch for loads in the range of 400 kips, with 50 to 60% of the settlement taking place during construction.

B. LATERAL EARTH PRESSURES

It is anticipated that earth retaining structures will be required for the proposed facility. Where earth retaining structures are required and if backfilling is performed using granular material, and if the backfill behind the wall is horizontal, we recommend that the earth pressures be calculated using the following equation, along with the earth pressure coefficient outlined below:

$$P = \tfrac{1}{2} K \gamma H^2$$

where P = total lateral force on the wall, plf
K = earth pressure coefficient
γ = unit weight of the soil (125 pcf)
H = height of the wall

The earth pressure coefficient used in designing the walls will depend upon whether the wall is free to move during backfilling operations, or whether the wall is restrained during backfilling. If the wall is free to move during backfilling operations and the backfill material is granular soil, we recommend an earth pressure coefficient of 0.30 be used in the above equation to calculate the lateral earth pressures. If the walls are restrained from any movement during backfilling and the backfill material is granular soil, we recommend an earth pressure coefficient of 0.45 be used to calculate the lateral earth pressures. It should be recognized that the pressure calculated by the above equation are earth pressures only and do not include hydrostatic pressures. Where hydrostatic pressures may exist behind a retaining structure, we recommend either the wall be designed to resist hydrostatic pressure, or that a drainage system be placed behind the wall to prevent the development of hydrostatic pressures.

C. SEISMIC CONSIDERATIONS

As indicated earlier in this report, the proposed site is located in Seismic Zone 3 according to the 1997 edition of the Uniform Building Code, and we recommend that the proposed facility be designed and constructed in compliance with the code. The allowable soil bearing pressure indicated above may be increased by one-third where seismic forces are involved in the structural loads. If the passive pressures associated with footings and walls are used to resist seismic forces, and if backfilling is performed using granular material, we recommend that the passive pressures be calculated from the lateral earth pressure equation using an earth pressure coefficient of 2.0. If the frictional resistance of the footings and floor slabs are used to resist seismic forces, we recommend a coefficient of friction of 0.40 be used to calculate these forces. Soil profile type S_D should be used for structural seismic design.

A recent report prepared by the U.S. Geological Survey indicates that the maximum acceleration having a 10% exceedance in 50 years in this area is about 0.29g. The recurrence interval for this condition is about 500 years. The maximum acceleration having a 10% exceedance in 100 years is about 0.43g. The recurrence interval for this condition is about 1000 years. A liquefaction analysis has been performed for the site assuming a seismic event having an acceleration of 0.3g.

The results of the analysis indicate that the loose sand layers below the water table and overlying the lean clay in Test Holes 1, 3, 5 and 6 will liquefy during the design seismic event. If the recommendations outlined in the foundation section of this report for spread footings on compacted fill are complied with, the major portion of this loose material will be removed and the groundwater level will be lowered, thus mitigating the liquefaction concern. The liquefiable material will be by-passed if deep foundations are used.

5. SITE PREPARATION AND COMPACTED FILL REQUIREMENTS

Since the first floor will be located several feet below the existing ground level, stripping requirements to remove excess organic material will be satisfied during the basement excavation -

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If spot footings are used to support the structure, several feet of compacted fill will be required below structural foundations. All sandy gravel supporting structural foundations should be well-graded with a maximum size less than 4 inches and with not more than 15% passing a 200 sieve. All structural fill should be placed in lifts not exceeding 8 inches after compaction and densified to an in-place unit weight equal to at least 95% of the maximum laboratory density as determined by ASTM D 1557-91. The specifications pertaining to the sandy gravel to be used as compacted fill should not be changed unless approved by the soil engineer.

It is anticipated that stabilization of the foundation excavations will be required prior to placement of structural fill. Stabilization techniques are dependant upon conditions encountered and construction methods. Where very soft silt or clay exists, it is anticipated that cobble rock will provide the most effective means of stabilization. Where cobble rock is required, it should consist of 3 to 8 inch rock placed in single lifts, tamped into the silt or clay such that the voids are filled. Excess cobbles which cannot be tamped into the cohesive material should be removed to prevent migration of fines into the voids, which would result in settlement. Placement of a geotextile fabric, such as Mirafi 600X or equivalent will be effective in stabilizing moderately soft areas.

The existing groundwater level on the east side of the site is about 16 feet below the floor of the P.E. building. It is expected that the water level may rise up to 2 feet above it's existing level in the late summer months due to irrigation practices on the bench east of campus or during periods of heavy precipitation. We recommend that a drainage system be installed around the periphery, supplemented with cross drains for either foundation type.

Grading around the structure should be performed in such a manner that all surface water will flow freely from the area and that no ponding will occur adjacent to the structure which will permit deep percolation into the foundation area. Roof drains should extend well beyond the building lines to prevent seepage into the foundation soils. Sprinkler heads located adjacent to the building should be directed away from the structure to prevent the percolation of water into the foundation zone.

Backfilling around foundation walls should be performed using granular material densified to an in-place unit weight equal to at least 90% of the maximum laboratory density indicated above.

The conclusions and recommendations presented in this report are based upon the results of the field and laboratory tests, which in our opinion, define the characteristics of the subsurface material throughout the site in a satisfactory manner. It should be recognized that soil materials are inherently heterogeneous and that conditions may exist throughout this site which could not be defined during this investigation. It is recommended that a soils engineer observe the foundation excavations. If structural fill is used to support foundations, we recommend that the fill be tested under the direct supervision of the soils engineer to verify that compaction requirements are complied with. If pile foundations are used, we recommend that a pile load test be performed at least one week prior to beginning full production to verify load capacity. If during construction, conditions are encountered which appear to be different than those presented in this report, it is requested that we be advised in order that appropriate action may be taken.

Sincerely,

RB&G ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
NO.162291
BRADFORD E.
PRICE
5/22/01
STATE OF UTAH

Bradford E. Price, P.E.

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Figures

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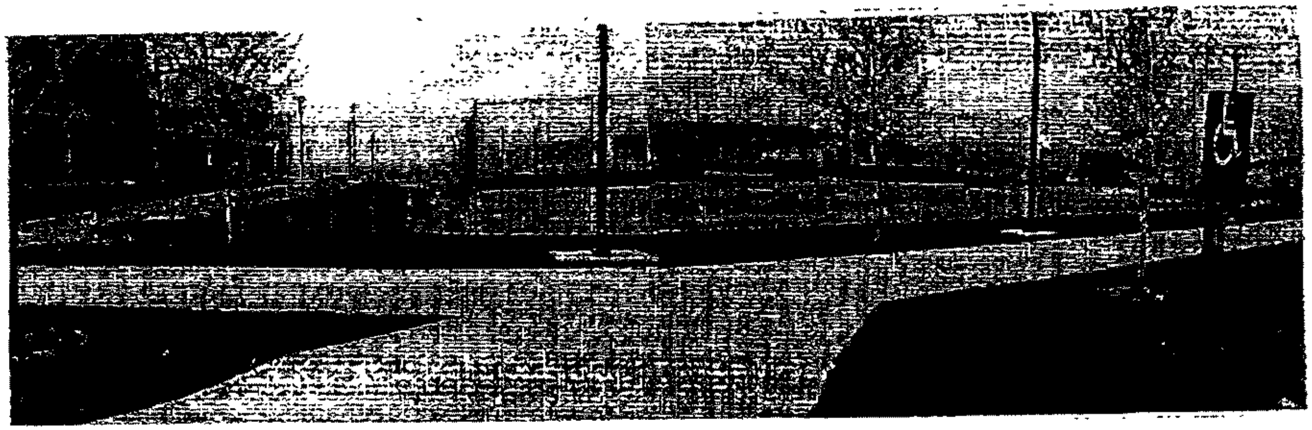
Figure 1
Photographs
UVSC New Academic Building
Orem, Utah

RB&G ENGINEERING, INC.



Photograph A. Looking in a westerly direction

Photograph B. Looking in a southerly direction

Photograph C. Looking in an easterly direction

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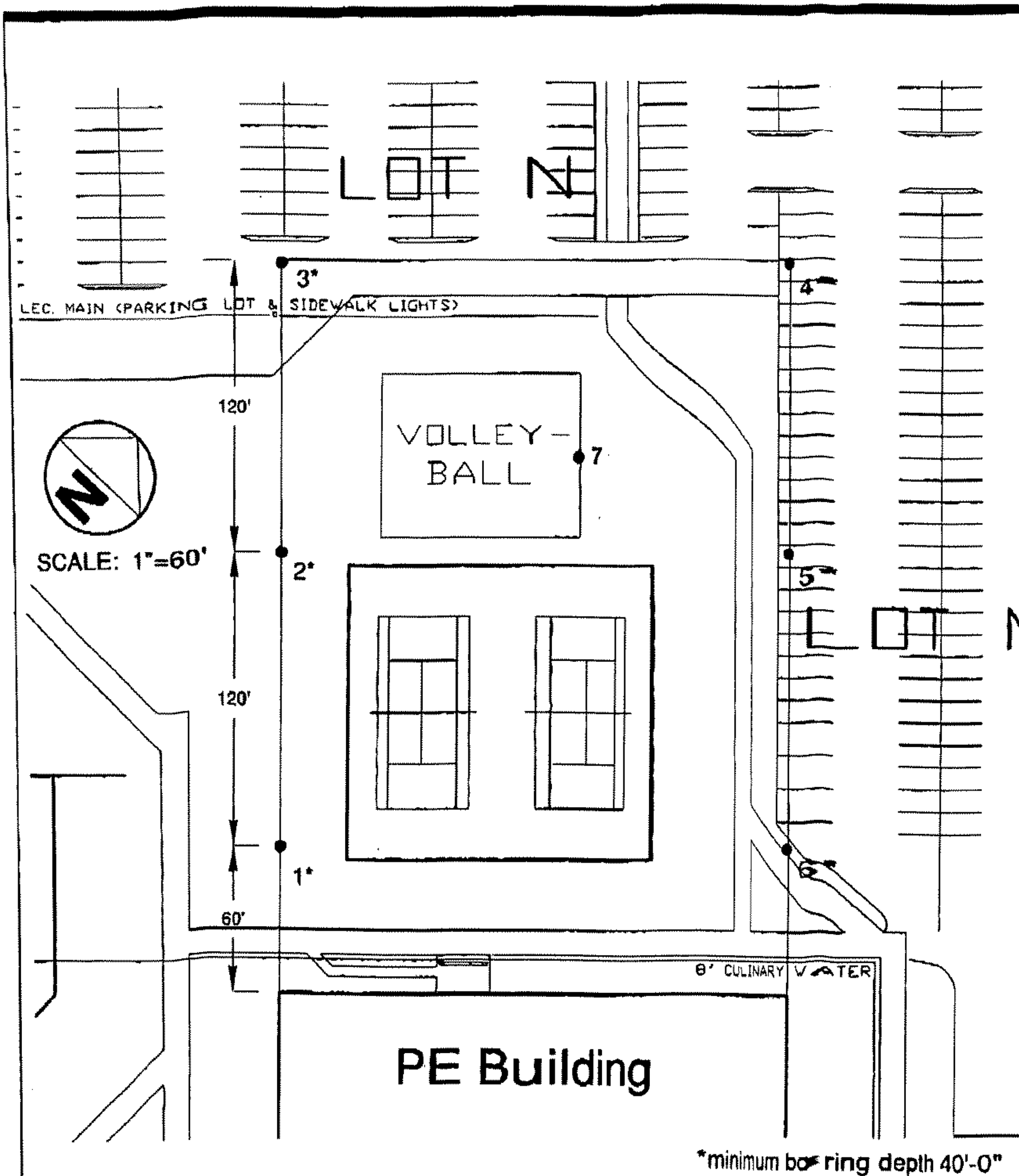

Building Description; Three-story building with 40,000 sq. ft. footprint. Construction cast-in-place frame and suspended floor structure with bar joist roof structure. Exterior walls to be brick veneer in-fill between concrete columns.

RB&G ENGINEERING INC.
Provo, Utah

Figure 2. BORING LOCATION

UVSC New Academic Building
Orem, Utah

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Test Hole Logs

LL HOLE LOG

PROJECT: NEW ACADEMIC BUILDING — PROJECT NO.: [illegible] Contents
CLIENT: DFCM - HFS ARCHITECTS — DATE: 4/26/01
LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT. — ELEVATION: 96.5
DRILLER: DEAN SAMPSON — LOGGED BY: T. EKKER
EQUIP./DRILL METHOD: CME-55 / N.W. CASING
DEPTH TO WATER - INITIAL: 17.0' AFTER 24 HOURS: -

ORING NO. 1

:1 of 1

Depth (Feet)	Rec. (in.)	Blows Per 6"	USCS	Material Description		Dry Density, pcf	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Silt/Clay, %	Other Tests
0–2	14	5,11,25	SM	dense, slightly moist	LT. BROWN SILTY SAND W/ GRAVEL TRACES								
3–5	10	11,21,20	SM	dense, moist									
6–8	12	28,31,27	SM	very dense, moist									
9–11	14	19,19,16	SM	dense, moist									
12–14	14	6,8,10	SM	medium, moist			19.0			0	78	22	
15–17		3,4,7	ML	stiff, very moist	INTERBEDDED LIGHT BROWN SANDY SILT AND SILTY SAND LAYERS		25.9	27	3	0	21	79	
20–22		2,3,5	SM	loose, wet			28.1			0	62	38	
25–27		2,2,3	ML	firm, very wet			30.1			0	40	60	
30–32	18	2,2,3 0.45	CL-1	firm, very wet	BROWN LEAN CLAY W/ SAND LENSES								
35–36	0		SM		BROWN LEAN CLAY W/ SAND LAYERS					0	84	16	
36–38	18	3,10,15 0.40	CL-1, SM	stiff, medium dense very moist									
40–42	18	3,4,6 0.26	CL-1	firm, very moist	BROWN LEAN CLAY								

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

LEGEND

2,3,2 ← Blow Count per 6"
0.45 ← Torvane (tsf)
Disturbed Sample
Undisturbed Sample
Groundwater Elevation

UC - Unconfined Compression Test
CT - Consolidation Test
SG - Specific Gravity Test

RB&G ENGINEERING INC.
Provo, Utah

LL HOLE LOG

BORING NO. 2

:1 of 1

PROJECT: NEW ACADEMIC BUILDING
PROJECT NO.: Contents
CLIENT: DFCM - HFS ARCHITECTS
DATE: 4/27/01
LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT.
ELEVATION: 97.3
DRILLER: DEAN SAMPSON
LOGGED BY: T. EKKER
EQUIP./DRILL METHOD: CME-55 / N.W. CASING
DEPTH TO WATER - INITIAL: 18.0' AFTER 24 HOURS: -

Depth (Feet)	Sample Rec. (in.)	Blows Per 6"	USCS	Material Description	Dry Density pcf	Moisture Content, %	Atter. Liquid Limit, %	Atter. Plasticity Index, %	Gradation Gravel, %	Gradation Sand, %	Gradation Silt/Clay, %	Other Tests
	9	2,3,5	SM	loose, slightly moist								
	14	4,12,10	SM	medium, slightly moist — BROWN SILTY SAND W/ GRAVEL TRACES								
	8	11,18,12	SM	medium, slightly moist								
10	12	13,18,14	SM	dense, moist								
	16	5,7,6	SM	medium dense, moist — BROWN SILTY SAND								
15	18											
	16	4,7,8	SM	medium dense, moist								
20	18		SM	medium dense, moist								
25	18	2,2,3 0.40	CL-1	firm, very moist								
30	18		CL-1, SM	firm, medium dense, very moist — BROWN LEAN CLAY W/SILTY SAND LENSES AND LAYERS								
35	13	5,13,18	CL-1, SM	stiff, very dense								
40	13	3,10,10 0.37	CL-1	very stiff, moist								

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

RB&G ENGINEERING INC.
Provo, Utah

LEGEND

2,3,2 — Blow Count per 6"
0.45 — Torvane (tsf)
Disturbed Sample
Undisturbed Sample
Groundwater Elevation

UC - Unconfined Compression Test
CT - Consolidation Test
SG - Specific Gravity Test

ILL HOLE LOG

PROJECT: NEW ACADEMIC BUILDING
CLIENT: DFCM - HFS ARCHITECTS
LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT.
DRILLER: DEAN SAMPSON
EQUIP./DRILL METHOD: CME-55 / N.W. CASING
DEPTH TO WATER - INITIAL: NM AFTER 24 HOURS: -

PROJECT NO.: Contents
DATE: 5/02/01
ELEVATION = 90.7
LOGGED BY: T. EKKER

ORING NO. 3

t: 1 of 1

Depth (Feet)	Rec. (In.)	Blows Per 6"	USCS	Material Description	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Silt/Clay, %
0	14	17,19,17	GM	6" ASPHALT; 7" ROAD BASE						
5	18	5,5,4	ML	BROWN SANDY SILT — stiff, slightly moist						
10	15	5,7,6	SM	BROWN SILTY SAND — medium, moist	29			0	64	36
	18	2,3,4	SM							
15	8	2,1,2	ML	BROWN SANDY SILT — soft, wet						
		2,2,3 / 0.31	CL-2	firm, very moist	32.9	38	15			
20	18	2,2,3 / 0.40	CL-2	BROWN LEAN CLAY — firm, very moist						
25	15	2,3,3 / 0.25	CL-1	soft, very moist						
30	15	2,3,12 / 0.35	CL-1, SM	BROWN LEAN CLAY W/ SAND LAYERS — soft, bery moist; medium dense						
35	18	11,18,50	SM	BROWN SILTY SAND — very dense, moist						
40	18	5,15,30	SM	dense, moist						
45										
50										

Other columns: Elev. (ft), Lithology, Type, Dry Density pcf, Other Tests.

RB&G ENGINEERING INC. Provo, Utah

LEGEND

2,3,2 ← Blow Count per 6"
0.45 ← Torvane (tsf)
Disturbed Sample
Undisturbed Sample
Groundwater Elevation

UC - Unconfined Compression Test
CT - Consolidation Test
SG - Specific Gravity Test

◄ Contents

LL HOLE LOG

BORING NO. 4

: 1 of 1

PROJECT: NEW ACADEMIC BUILDING — PROJECT NO.: 200101.026
CLIENT: DFCM - HFS ARCHITECTS — DATE: 4/27/01
LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT. — ELEVATION: 92.4
DRILLER: DEAN SAMPSON — LOGGED BY: T. EKKER
EQUIP./DRILL METHOD: CME-55 / N.W. CASING
DEPTH TO WATER - INITIAL: 8.5' AFTER 24 HOURS: 8.5'

Rec. (in.)	Blows Per 6"	USCS	Material Description	Dry Density pcf	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Silt/Clay, %	Other Tests
12	12,25,21	GM	4" ASPHALT / 7" ROAD BASE								
14	5,6,6	SM	medium dense, moist — LT. BROWN SILTY SAND								
18	4,5,9	SM	medium dense, wet								
18	2,2,3	ML	firm, very moist — LT. BROWN SANDY SILT		33.9		NP	0	32	67	
18	0.40	CL-2	firm, very moist	77.8	35.6	38	16				CT UC
18		CL-1	firm, very moist								UC
18		CL-1 W/ML	firm, very moist								UC
18	0.77	CL-1	firm, very moist — BROWN LEAN CLAY W/ SILTY SAND & SANDY SILT LENSES & LAYERS								
14	0.53	CL-1	firm, very moist								
18	0.53	CL-1	firm, very moist								
18	6,12,20	SM	dense, wet								
18	3,6,7	CL-1 W/SM	stiff, moist								
12	6,6,11	SM	medium dense, wet — LT. BROWN SILTY SAND								

Depth (Feet): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Undisturbed Sample
- Groundwater Elevation

UC - Unconfined Compression Test
CT - Consolidation Test
SG - Specific Gravity Test

RB&G ENGINEERING INC.
Provo, Utah

ILL HOLE LOG

PROJECT: NEW ACADEMIC BUILDING
CLIENT: DFCM - HFS ARCHITECTS
LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT.
DRILLER: DEAN SAMPSON
EQUIP./DRILL METHOD: CME-55 / N.W. CASING
DEPTH TO WATER - INITIAL: 9.0' AFTER 24 HOURS: -

PROJECT NO.: Contents
DATE: 4/26 /01
ELEVATION: 93.1
LOGGED BY: T. EKKER

ORING NO. 5

t: 1 of 1

Depth (Feet)	Rec. (In.)	Blows Per 6"	USCS	Material Description	Dry Density pcf	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Silt/Clay, %	Other Tests
0	18	14,25,19	GP-GM	3.5" ASPHALT; ROAD BASE								
	18	7,11,15	SM	medium dense, slightly moist — LT. BROWN SILTY SAND W/ CLAY LENSES								
5	18	5,7,8	SM	medium dense, moist								
	18	3,4,3	SM	loose wet — LT. BROWN SILTY SAND								
	18	2,2,3	SM	loose wet								
15	12	0.30	CL-1 W/SM, ML	firm, very moist	85.5	33.5	28	3				CT UC
	12	0.42	CL-1	firm, very moist	81.0	33.5	35	13				UC
20	12	0.44	CL-1 W/SM	firm, very moist	84.5	34.1	34	12				CT
	18	1,2,5	CL-1	firm, very moist								
25	18	2,3,10 0.36	CL-1 W/SM, ML	firm, very moist /medium dense, wet — BROWN LEAN CLAY W/ SILTY SAND & SANDY SILT LENSES & LAYERS								
30	12	0.41	CL-1 W/SM	firm, very moist								
35	18	2,5,11	CL-1 W/SM	firm, very moist /medium dense, wet								
40	12	0.37	CL-1	firm, very moist								
	18	3,11,17		medium dense, wet — BROWN SILTY SAND								

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

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Provo, Utah

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Undisturbed Sample
- Groundwater Elevation

UC — Unconfined Compression Test
CT — Consolidation Test
SG — Specific Gravity Test

ILL HOLE LOG

PROJECT: NEW ACADEMIC BUILDING
PROJECT NO.: 2[illegible]
Contents

CLIENT: DFCM - HFS ARCHITECTS
DATE: 5/0 2/01

LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT.
ELEVATION: 94.1

BORING NO. 6

DRILLER: DEAN SAMPSON
LOGGED BY: T. EKKER

EQUIP./DRILL METHOD: CME-55 / N.W. CASING

t: 1 of 1

DEPTH TO WATER - INITIAL: 10.0' AFTER 24 HOURS: 10.0'

Depth (Feet)	Rec. (in.)	Blows Per 6"	USCS	Material Description		Dry Density, pcf	Moisture Content, %	Atter. Liquid Limit, %	Atter. Plasticity Index, %	Gradation Gravel, %	Gradation Sand, %	Gradation Silt/Clay, %	Other Tests
	18	5,8,7	ML	stiff, slightly moist	GRASS DK. BROWN SANDY SILT								
5	18												
	18	2,2,2	SM	loose, wet	LT. BROWN SILTY SAND		24.7			0	83	17	
10	18	2,2,3	SM	loose, wet			29.1			0	64	36	
15	18	2,2,1	SM, ML	soft wet	LT. BROWN SANDY SILT		32.9			0	50	50	
	18	1,1,2	ML	soft wet			32.8			0	38	62	
20	18	1,2,2 0.30	CL-1	soft, very wet	LT. BROWN CLAY W/ SILTY SAND & SANDY SILT LENSES & LAYERS		36	34	13				
25	3	3,1,2 0.19	CL-1	soft, very wet				38	14				
30	18	2,2,7	CL-1	firm, very wet									
35	18	4,10,10	SM W/ CL-1	moist, dense wet	LT. BROWN SILTY SAND W/ CLAY LENSES & LAYERS								
40	18	7,10,23	SM W/ CL-1	dense, wet									
45													
50													

LEGEND

2,3,2 — Blow Count per 6"
0.45 — Torvane (tsf)
Disturbed Sample
Undisturbed Sample
Groundwater Elevation

UC - Unconfined Compression Test
CT - Consolidation Test
SG - Specific Gravity Test

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Provo, Utah

ILL HOLE LOG

PROJECT: NEW ACADEMIC BUILDING
CLIENT: DFCM - HFS ARCHITECTS
LOCATION: UTAH VALLEY STATE COLLEGE-OREM, UT.
DRILLER: DEAN SAMPSON
EQUIP./DRILL METHOD: CME-55 / N.W. CASING
DEPTH TO WATER - INITIAL: 11.5' AFTER 24 HOURS: -

PROJECT NO.: 2… Contents
DATE: 5/02/01
ELEVATION: 94.7
LOGGED BY: T. EKKER

BORING NO. 7

t: 1 of 1

Depth (Feet)	Rec. (In.)	Blows Per 6"	USCS	Material Description	Dry Density pcf	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Silt/Clay, %	Other Tests
	15	3,4,7	SM	medium dense, moist — LT. BROWN SILTY SAND								
	15	10,9,6	SM	medium dense, moist								
5	18	3,6,7 0.35	CL-1	firm moist — TAN LEAN CLAY								
10	14	2,3,2	SM	loose, very moist — LT BROWN SILTY SAND		25.8			0	58	42	
	8	2,2,2	ML	soft wet — LT BROWN SANDY SILT		29.1			0	45	55	
15	15	1,1,2	ML	soft wet								
	18	1,2,1 0.20	CL-1	soft, very moist — LT. BROWN LEAN CLAY								
20	18	2,1,2 0.25	CL-1	soft, very moist								

Depth scale: 5, 10, 15, 20, 25, 30

LEGEND

2,3,2 ← Blow Count per 6"
0.45 ← Torvane (tsf)
Disturbed Sample
Undisturbed Sample
Groundwater Elevation

UC - Unconfined Compression Test
CT - Consolidation Test
SG - Specific Gravity Test

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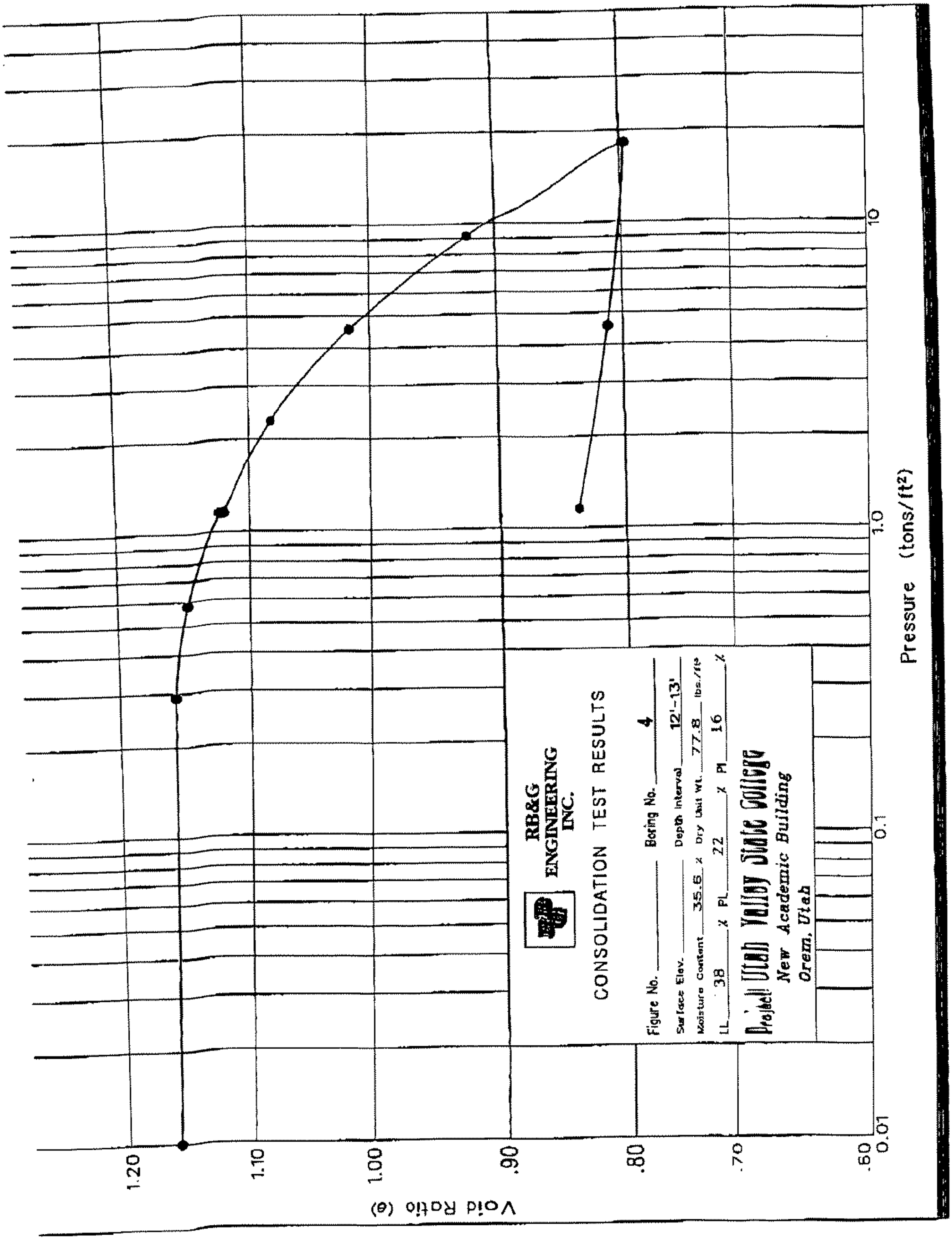
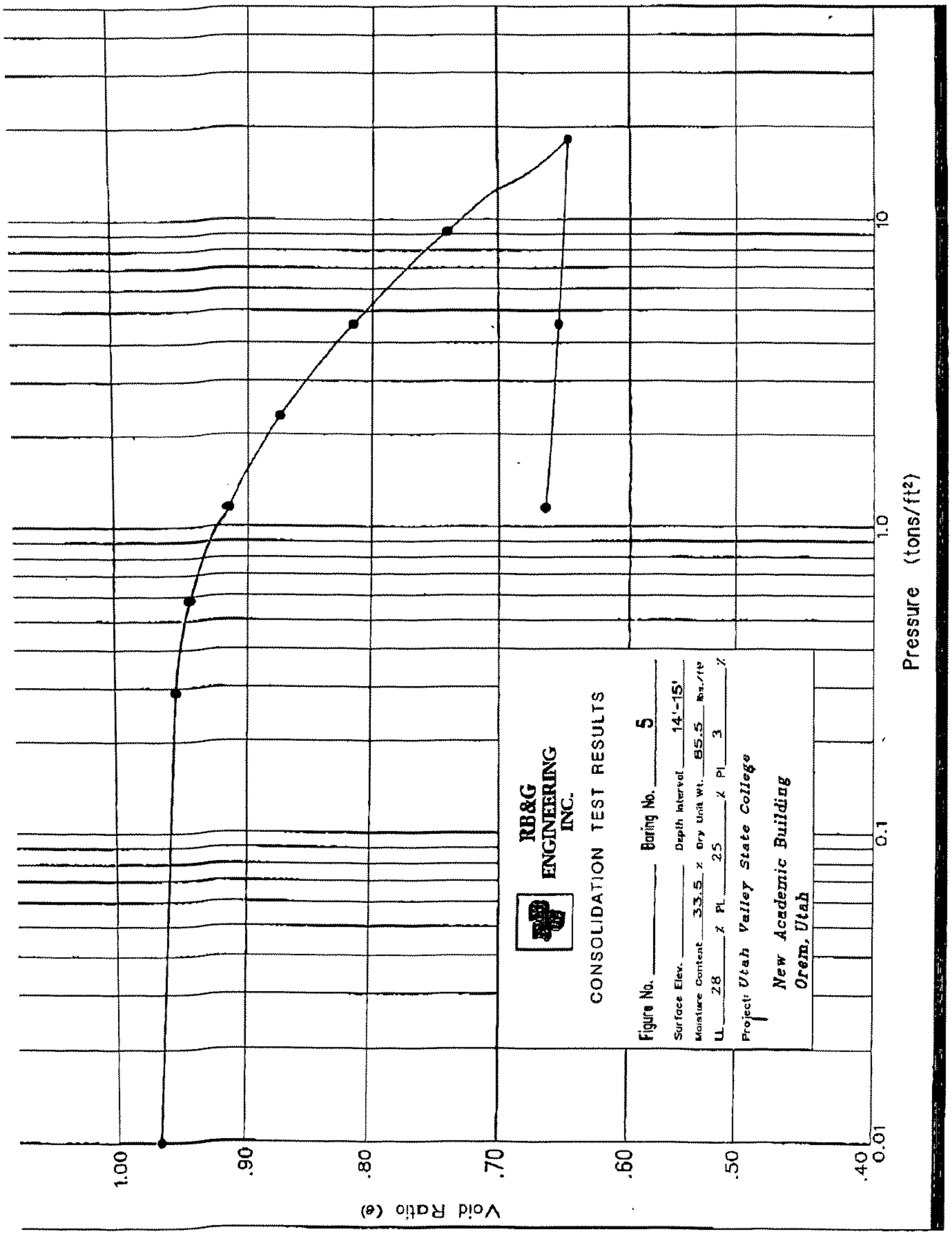
Laboratory Testing

◀ Contents


RB&G ENGINEERING INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. 4
Surface Elev.
Depth Interval 12'-13'
Moisture Content 35.6 %
Dry Unit Wt. 77.8 lbs./ft³
LL 38 % PL 22 % PI 16 %
Project Utah Valley State College New Academic Building Orem, Utah
Void Ratio (e)
1.20
1.10
1.00
.90
.80
.70
.60
Pressure (tons/ft²)
0.01
0.1
1.0
10

◀ Contents


RB&G ENGINEERING INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. 5
Surface Elev.
Depth Interval 14'-15'
Moisture Content 33.5 %
Dry Unit Wt. 85.5 lbs./ft³
LL 28 % PL 25 % PI 3 %
Project: Utah Valley State College
New Academic Building
Orem, Utah
Pressure (tons/ft²)
0.01
0.1
1.0
10
Void Ratio (e)
1.00
.90
.80
.70
.60
.50
.40

◀ Contents

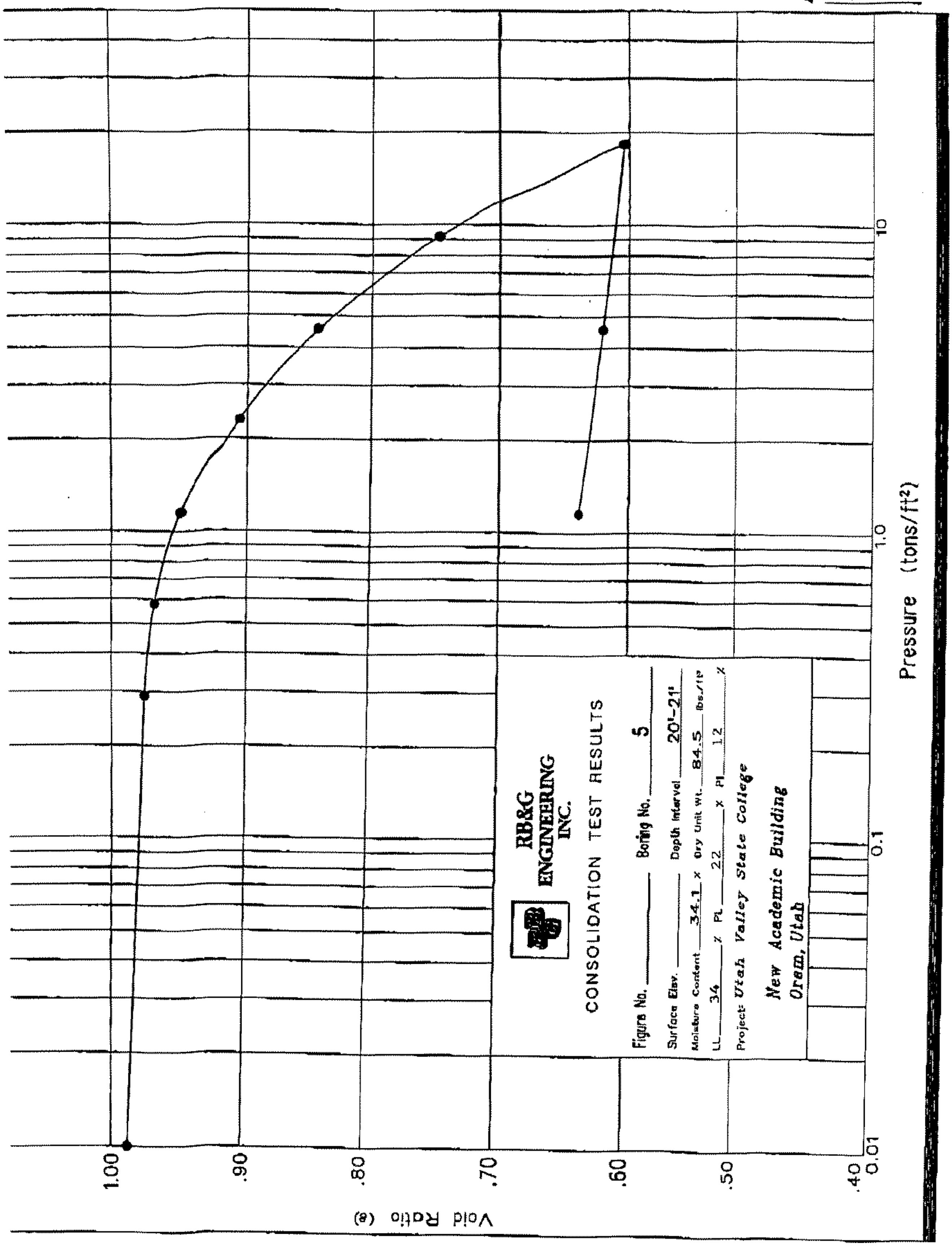

RB&G ENGINEERING INC.
CONSOLIDATION TEST RESULTS
Figure No. ___ Boring No. 5
Surface Elev. ___ Depth Interval 20'-21'
Moisture Content 34.1 % Dry Unit Wt. 84.5 lbs/ft³
LL 34 % PL 22 % PI 12 %
Project: Utah Valley State College
New Academic Building
Orem, Utah
Void Ratio (e)
1.00
.90
.80
.70
.60
.50
.40
Pressure (tons/ft²)
0.01
0.1
1.0
10

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Table 1

SUMMARY OF TEST DATA

ROJECT	New Academic Building	PROJECT NO.	200101-026
OCATION	Orem, Utah	FEATURE	Foundations

OLE IO.	DEPTH BELOW GROUND SURFACE (ft)	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE		UNCONFINED COMPRESSIVE STRENGTH (psf)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM (modified)
			DRY UNIT WEIGHT (pcf)	MOISTURE (%)		LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY	
1	12	18		19.0				NP	0	78	22	SM
	15	11		32.8		27	24	3	0	21	79	ML
	20	8		26.1				NP	0	62	38	SM
	25	5		30.1				NP	0	40	60	ML
	35-36.5							NP	0	84	16	SM
3	9	13		29.0				NP	0	64	36	SM
	17	5		32.9	1240 *	38	23	15				CL-2
4	9	5		33.9				NP	0	33	67	ML
	12	Shelby	77.8	35.6	1590	38	22	16				CL-2
	15-16.5				1791							CL-1
	18-19.5				1355							CL-1
5	14	Shelby	85.5	33.5	1276	28	25	3				CL-1, ML
	17	Shelby	81.0	33.5	1579	35	22	13				CL-1
	20	Shelby	84.5	34.1	1760 *	34	22	12				CL-1
6	8	4		24.7				NP	0	83	17	SM
	11	5		29.1				NP	0	64	36	SM
	14	3		32.9				NP	0	50	50	SM/ML
	17	3		32.8				NP	0	38	62	ML
	20	4		36.0	1200 *	34	21	13				CL-1
	25	3			760 *	36	22	14				CL-1
7	9	5		25.8				NP	0	58	42	SM
	12	4		29.1				NP	0	45	55	ML

'=Nonplastic
orvane value used to estimate unconfined compressive strength.

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Appendix

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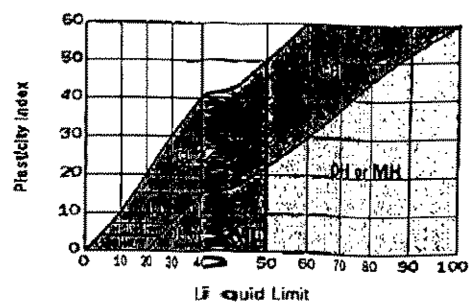
nified Soil Classification System

Major Divisions			Group Symbols		Typical Names
COARSE-GRAINED SOILS *more than alf of material is larger than No. 200 sieve*	Gravels *more than half of coarse fraction is larger than No. 4 sieve size*	Clean Gravels *little or no fines*	GW		Well graded gravels, gravel-sand mixtures, little or no fines
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines
		Gravels With Fines *appreciable amount of fines*	GM*	d	Silty gravels, poorly graded gravel-sand-clay mixtures
				u	
			GC		Clayey gravels, poorly graded gravel-sand-clay mixtures
	Sands *more than half of coarse fraction is smaller than No. 4 sieve size*	Clean Sands *little or no fines*	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands, gravelly sands, little or no fines
		Sands with Fines *appreciable amount of fines*	SM*	d	Silty sands, poorly graded sand-silt mixtures
				u	
			SC		Clayey sands, poorly graded sand-clay mixtures
FINE-GRAINED SOILS *more than alf of material smaller than No. 200 sieve*	Silts and Clays *liquid limit is less than 50*		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	1	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				2	
			OL		Organic silts and organic silt-clays of low plasticity
	Silts and Clays *liquid limit is greater than 50*		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt		Peat and other highly organic soils

Laboratory Classification Criteria

For laboratory classification of coarse-grained soils Determine percentage of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: **Less than 5%** GW, GP, SW, SP **More than 12%** GM, GC, SM, SC **5% to 12%** Borderline cases requiring use of dual symbols**	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3		
	Not meeting all gradation requirements for GW		
	Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring uses of dual symbols	
	Atterberg limits above "A" line, or PI greater than 7		
	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3		
	Not meeting all gradation requirements for SW		
	Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring uses of dual symbols	
	Atterberg limits above "A" line, or PI greater than 7		

For laboratory classification of fine-grained soils



Plasticity Chart

NOTE: USCS Modified to include CL-type subcategories

*Division of GM and SM groups into subdivisions of d and u for roads and airfields only. Subdivision is based on Atterberg limits: suffix d used when liquid limit is 28 or less and the PI is 6 or less, the suffix u used when liquid limit is greater than 28.

***Borderline classification:* Soils possessing characteristics of two groups are designated by combinations of group symbols. (For example GW-GC, well graded gravel-sand mixture with clay binder.)